THE IMPROVED EASTERN BLUEBERRY IN CALIFORNIA

Wm. T. Horne

One of the notable achievements of a botanical-horticultural character in recent times is the successful introduction of the American blueberries into cultivation, and the improvement of these fruits by selection and breeding. As botanists know, credit for this two-fold accomplishment is due to Mr. F. V. Coville, botanist in the U. S. Department of Agriculture. A share should go also to Miss Elizabeth C. White of New Lisbon, New Jersey.

The blueberries of New England and the middle Atlantic states, both the high-bush blueberry, Vaccinium corymbosum, and the low-bush blueberry, V. angustifolium, have long been prized for their unique character and exquisite mildness. The plants grow in abundance in somewhat boggy places and in some of the open lands. When, however, cultivation was attempted, plants taken from the wild and set in home gardens regularly perished.

How the botanists were able to find out what was wrong with garden soils, so far as blueberries are concerned, is told in "Directions for blueberry culture," 1921 (1) and other papers to which the bulletin with the above title gives references. In brief, the ordinary enrichment of the soil with lime, wood ashes, and animal manures, changes its naturally acid condition to neutral or alkaline. This is favorable to most garden plants, but is fatal to blueberries. Strictly speaking, the blueberry itself is not directly injured; but it depends for prosperity on a certain fungous growth on its roots, and this fungous growth requires an acid soil. The presence of such fungi on the roots of various plants has long been known, and they have been called mycorrhizas. When the home garden was supplied with suitable acid soil, blueberries were found to thrive. If soils of suitable chemical qualities were chosen, it was also found that blueberries could be propagated and grown as a field crop like other bush fruits, and with promise of profit.

When the subject of cultivating blueberries was considered it immediately became apparent that the wild plants were extremely variable in size and quality of fruit and in productiveness. The story of how the plants producing the best fruits were discovered and tested is more delightful than a romance. Then, from the best plants thousands of seedlings were grown, and at last a few saved as promising for commercial planting.

For a long time I have been possessed of a growing curiosity to know whether the Eastern blueberries could be made to thrive in California, and especially I had coveted the improved varieties. From time to time I heard of this person or that who had tried them, but only to fail. In the winter of 1925-26 I selected a little spot in my garden where I thought they might possibly be given a fighting chance.

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Through Mr. Coville I got in touch with the J. C. White nurseries, Whitesbog, New Jersey, and received from them the offer of a remarkably generous gift of plants for introducing in different parts of the state where they might be expected to succeed. Fearing the possible introduction of the Japanese beetle into California, I finally declined the larger offer, but I did receive, gratis, six sturdy little plants, one each of the varieties Adams, Grover, Harding, Pioneer, Rubel, and Sam. The plants were carefully examined by the County Horticultural Inspector, as well as by his chief, the County Horticultural Commissioner, and the Plant Quarantine Officer of the Port of San Francisco. In spite of all this attention, I was not convinced that some Japanese beetle larvae might not escape detection among the roots, which were densely matted and retained tenaciously the peat in which they had grown. Accordingly, the plants were potted and placed in large insect-proof cages, and all material from about their roots carefully sterilized. When the middle of August passed without the emergence of Japanese or other beetles, the plants were considered safe and were moved to the open. They made an apparently healthy but moderate growth. The limitation of the pots and the soil used probably accounted for the small growth. The soil available was a mixture of sand, sphagnum, and river peat. The last is not considered very favorable for blueberries.

Now came the most critical time of all. How would these strangers from a stern Atlantic climate take their winter rest and emerge into growth in the spring? The Eastern blueberries had been shown to be plants for which winter cold was necessary for normal growth (2). We used to say that cold was needed to cause various plants to take a proper rest, but now we are told that many plants enter the rest period during summer or autumn. The effect of cold weather is not to induce the rest but to break it, so they may grow off rapidly in the spring. Professor Chandler has an excellent discussion of this subject in his recent book, "Fruit Growing" (3).

One of the classic experiments on rest period in plants showed that blueberries in the greenhouse during the spring and summer grew normally, gradually ceased growing, and thereafer never renewed growth, though kept in the warm greenhouse until they died. One branch of such a plant which had ceased to grow was taken out through an opening and kept outside during freezing weather, but not detached from the plant, which remained in the greenhouse, In its normal season the exposed branch burst into new growth, but the part of the plant which had remained in the warm house failed to start. Not only blueberries but many other plants need the winter cold to grow properly in spring. Especially south of the Tehachapis, in California, peaches, walnuts, and many trees start growth very tardily in some springs, and lose the crop of the year, presumably because of a too mild winter (4).

With the approach of autumn, our blueberries were watched with an increasing interest. The formation of new shoots gradually ceased. Buds appeared in the leaf axils, but they were not of equal size and

apparent firmness. Autumn colors gradually spread over the leaves, but the coloring showed considerable variation in the six varieties. Some were decidedly high colored and would make an attractive show for a rather long time. Before midwinter all the plants were bare of leaves, as befits orderly deciduous shrubs.

The autumn of 1926 was probably not normal in Berkeley, for the deciduous magnolias blossomed in November and developed some leaves, instead of waiting until spring. Also camellias blossomed in the fall. The winter, 1926-27, however, should not be considered unusual as regards temperature. During December and January there were a number of mornings with white frost, but only very tender plants were injured. Callas frequently showed some wilting but always recovered during the day. During the late winter there were protracted heavy rains, and in early April there was a cold spell, following which most apricot and plum blossoms fell and a good many apricot and cherry trees died from the condition called sour sap.

Until midwinter, all the blueberries, in eight-inch pots plunged in the ground, were exposed between two of the greenhouses at the northwest part of the Berkeley campus. Then two of the plants were sent to a co-operator in Sonoma County. Three of them were set in

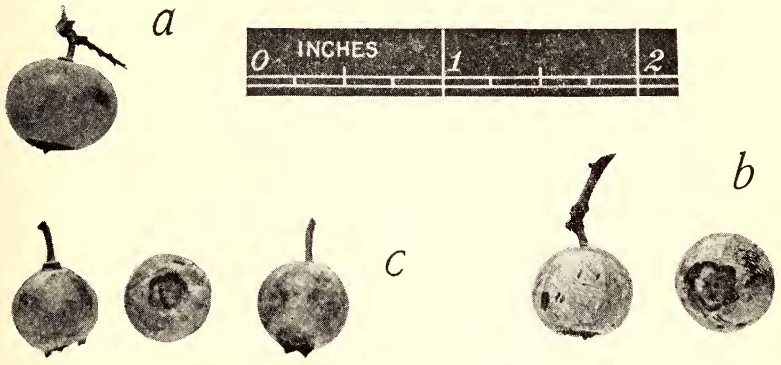

Fig. 1. Blueberry fruits from the garden of W. T. Horne in Berkeley. *a*, Harding, June 29, 1927; *b*, Pioneer, June 15, 1927; *c*, Rubel, June 29, 1927. Most of the Rubel fruits came in generous clusters but they did not ripen uniformly in the clusters. Photograph by W. C. Mathew.

my own garden. The plant of Grover was left undisturbed in its eight-inch pot. It blossomed somewhat later than those in my garden and, though apparently normal in every way, the calyces remained green for a long time without ever swelling into fruits. This indicates the necessity of having more than one variety in a planting to secure cross fertilization. The bushes at my house started in an apparently normal manner and grew moderately. They blossomed sufficiently to indicate fruitfulness, and set well. No attempt was made to keep accurate phenological data, but flowering was rather long-continued, though practically finished by May 10. Fruit was about all ripe by

July 10, though a few small Rubels persisted to near the end of August. The largest single fruit was produced by the Harding, and the largest number and the largest clusters by the Rubel. The three plants, in three separate plots, have been growing in sand with a little sphagnum and, respectively, pine needles, acacia leaves, and oak leaf mold. There has been an occasional application of a few ounces of sulfur and sulfate of ammonia to the soil, which has received an occasional generous sprinkling, but has not been watered copiously or regularly.

From the foregoing it seems probable that the improved Eastern blueberries can be grown in the central and north coast districts of California. The essential conditions, adapted from Mr. Coville, are first, an acid soil (5), in which usually sand and upland peat are the most favorable constituents; second, an adequate supply of moisture; third, freedom from soil saturation during the growing season. It is not my idea that we are ready for the commercial exploitation of blueberries in California, but that these plants offer most alluring possibilities for those lovers of rare and exquisite fruits, who are not afraid to take pains and trouble, who are not thinking in terms of dollars, but who enjoy horticultural adventure. Very probably, however, blueberries will some day be grown for profit in some parts of California.

Certain suggestions arise. Perhaps our own native blueberry or huckleberry (6) is capable of improvement; it may be that some of its forms are sweet and smooth in flavor and texture and large in size; or perhaps it could be crossed with the Eastern forms and give new fruit of unexpected merit. Who can predict what may be found and even brought to being in the way of California blueberries? If any plant lovers should be attracted by the idea of growing blueberries, they would do well to seek the co-operation of the local horticultural commissioner or other plant quarantine official in connection with the bringing in of plants.

(1). Coville, Frederick V. Directions for blueberry culture. Bulletin 974, U. S. Department of Agriculture, 1921.

(2). Coville, Frederick V. The influence of cold in stimulating the growth of plants. Journ. Agr. Research. 20, pp. 151-160, pls. 20-35. 1920.

(3). Chandler, W. H. Fruit Growing. Pp. i-xv and 1-777, 60 figures, 84 tables. Houghton Mifflin Co., 1925.

(4). Horne, W. T., Geo. P. Weldon, and E. B. Babcock. Resistance of Peach hybrids to an obscure disease in Southern California. Journ. of Heredity, Vol 18, pp. 99-104, figs. 5-8. March, 1926.

(5). The degree of acidity said to be favorable for blueberries is expressed technically as PH=5. A neutral soil would be described as PH=7, and PH=8 or a higher number, would indicate an alkaline soil. Much of our soil in the north coast country is too acid for best results with farm crops and the use

of lime is rather general. By consulting the local Farm Adviser or the College of Agriculture, Berkeley, arrangements can probably be made to test the acidity of the soil in any particular locality.

(6). Professor W. L. Jepson, in his "Manual of the Flowering Plants of California," lists six species and two varieties of the genus Vaccinium, and it is interesting to note that the variety saporosum Jepson, set off from V. ovatum Pursh., is said to possess fruits of superior flavor. V. ovatum, the evergreen California huckleberry, is a valuable commercial ornamental green, and its fruit is collected and canned in at least one factory in northern California.

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THE BOTANICAL EXPLORERS OF CALIFORNIA.—III.

Willis Linn Jepson

George Hansen

The foothill region of the Sierra Nevada has always been, considering its importance in relation to plant distribution and to ecology, a neglected region from the botanical viewpoint. There have been on the whole few resident botanists in that area, and fewer still whose residence or interest lasted over a long period. For shorter periods, however, good work in exploration and in local studies has been done. In the early years of the nineties the settlers in the foothills of Calaveras County became familiar with the sight of a man who, on holidays and Sundays, went through the cañons and over the hillslopes, into the forests and river bottoms, gathering specimens of native flowers, trees and shrubs and bestowing them in a long tin box which he carried or frequently in a kind of wooden press bound by leather straps. This was George Hansen, a German. The foothill folk sometimes thought his interests in native things strange or eccentric, but he was well liked by all of them on account of his ever cheerful disposition and courteous demeanour.

George Hansen was born April 15, 1863 in Hildesheim in Hanover. He was the grandson of J. G. K. Oberdieck, sometimes called the Father of German Pomology. On account of his services to the state the Prussian Government granted to Herr Oberdieck a free college education to such of his grandsons as desired to work in horticulture. It fell out, in consequence, that the young Hansen, after completing the work of the gymnasium in his birthplace, was sent to Potsdam for the course in the Royal College of Pomology.

In 1885 he went to England and took employment with F. Sander & Company, working at first in the orchid house and later making